

There was water in the staterooms and even in the captain's room on the bridge. The following note was written in the log at about this time:

"Hurricane winds with high seas. Ship laboring heavily. Taking heavy seas over forward and after decks."

The pressure dropped to its lowest point at 1 p. m., 28.05 inches (a test of this barometer at 28 inches showed that it was reading too high by 0.20 inch, making the corrected reading 27.85 inches). From 11 a. m. to 2 p. m. the wind blew with hurricane force, and waves were mountainous. After 1 p. m. the pressure rose quickly and by 4 p. m. it was 29.20. At 5 p. m. there was noted a backing of the wind, although the velocity was still high, north-northeast 10. As the wind continued to back the velocity decreased. By midnight the pressure had risen to 29.55 and the wind blew from the northwest with a force of 6.

The following is quoted from the report of the official in charge of the Weather Bureau office at Key West:

The storm's center at its nearest approach to Key West was 90 miles distant. This was about noon of the 20th, when the center bore northwest.

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NOTES, ABSTRACTS, AND REVIEWS

WETTERVORHERSAGE (WEATHER FORECASTING)¹

This volume is No. XI in the series of natural science publications brought out by Dr. Raphael Ed. Leisegang, Frankfurt-am-Main. The author, Doctor Georgii, is instructor in meteorology in the University of Frankfurt and has written a number of papers on meteorological subjects, especially within the last few years.

After sketching in Chapter I the development of weather forecasting since the time of Dove and indicating the synoptic weather reports available to European forecasters, together with the means of collecting and charting them, the author proceeds, in Chapter II—The dependence of the weather on pressure formations and air streams induced thereby—to discuss the problems of weather forecasting from synoptic weather charts. His method of developing the subject is quite naturally that of an instructor in meteorology.

He begins with the fundamental concepts of air movement as dependent upon the pressure distribution with such modifications as are introduced by surface friction, the rotation of the earth on its axis, and other influences, and these are clearly developed with the help of mathematical formulae, diagrams, and weather charts, the latter rather highly idealized with relation to air streams.

Very early in the discussion the results put forward by the Bjerknes school of meteorologists are considered and discussed, the author finding supporting evidence and illustrations in kite flights made in continental Europe. This discussion naturally leads to a consideration of the theories of origin of cyclones and anticyclones. A very full exposition of the Bjerknes wave theory is given and also of Exner's so-called drop theory. Since the latter is perhaps not well known to readers of the REVIEW in this country a brief abstract is given in the following paragraphs.

According to Exner, in the original stationary condition the isotherms and the isobars run parallel to each other. North of the line of discontinuity pressure is relatively high; south thereof relatively low. Normally polar air masses have an east-west movement. These winds, however, meet obstacles to their free and unobstructed westward movement, as on the east Greenland coast, Spitzbergen, and elsewhere in high latitudes. The winds are then deflected toward the south by the configuration of the earth's surface.

Notwithstanding the strong and consistently increasing winds which began during the night of the 19th and which culminated at 2 p. m. of the 20th with a maximum velocity of 66 miles an hour from the southwest, this storm caused no damage in Key West aside from some little damage to trees and shrubbery. There was no damage to shipping whatsoever. This was unusual in the face of a wind that for 17 hours maintained a velocity averaging 51 miles an hour, with gusts ranging from 54 to 74 miles an hour, and can be ascribed only to timely and persistent warnings issued by the Weather Bureau. Taking advantage of these warnings, all vessels, large and small, were made secure, windows and doors battened, and in a number of cases trees trimmed in order to lessen the wind effect and possibly save them.

As a result of warnings broadcast by radio, several vessels sought refuge in port. All P. & O. steamers were held on advice from this office. The following vessels were held in port pending the passage of the storm: Steamers *W. F. Burdell*, *J. R. Gordon*, *Roanoke*, *Estrada Palma*, *Henry M. Flagler*, *Joseph R. Parrott*, *Miami*, *William Islam*, and *Gouvernor Cobb*, and the schooner *Mary Thompson*.

The bureau's work on this hurricane has called forth much praise from outside sources.

Since these masses of cold air by reason of their greater density are associated with higher pressure, the isobars in accordance with the deflection of the winds become curved toward the south. In the advanced stage the tongue of cold air forms more and more an inclosed center of high pressure with anticyclonic movement.

The warm west winds which here have been lifted from the ground by the cold air masses still blow (aloft) over the tongue of cold air and on its front side exerts a suction effect on the lower masses of warm air similar to that observed on the leeside of mountains on the passage thereover of the wind. As a result, this suction effect will produce on the front side of the tongue of cold air a dynamic pressure diminution which intensifies the already present low pressure thermally caused.

On the front side there are supplied to this cyclone thenceforth additional warm air masses. Thus, the cyclonic information acquires new energy through the intensifying of the temperature contrast.

Finally, the upper wind blowing over the tongue of cold, together with the movement of the lower cold and warm air masses resulting from the cyclonic formation, produce a migration toward the east. After the tongue of cold air has moved eastward of the point of invasion the earlier stationary condition gradually reestablishes itself until marked temperature contrasts have again developed, which produce a further sudden advance of cold.

In this way the intrushes of cold and the cyclonic formations become a periodic process which recurs at intervals at certain definite places on the earth.

Since the cold air masses disengage themselves droplike from the polar reservoir of cold, Exner's theory is called the "drop" theory of cyclones in contrast to Bjerknes wave theory.

The author makes the distinction that both the Bjerknes and the Exner theories explain the origin only of one group of cyclones, viz, that which is found in the lower levels—2 to 3 km. where the pressure differences are thermally produced.

It is not clear just how a distinction is to be made in actual forecasting between the influence of the two respective groups—those originating in the lower levels and those having their origin in the stratosphere.

The closing chapter on "long-range weather forecasting" brings forward little that is new or suggestive, perhaps for the very good reason that with the exception

¹ Wettervorhersage, W. Georgii, Dresden und Leipzig, 1924.

of the Indian meteorological service no other meteorological institution has developed a method of making dependable seasonal forecasts.

While the volume has been prepared with the needs of European forecasters in mind, it will be helpful to others as well, since many of the atmospheric processes described are of general occurrence, modified locally, of course, by the distribution of land and water and other peculiarities due to geographic factors.—A. J. H.

WEATHER ELEMENTS AFFECTING THE 1924 WINTER-WHEAT CROP IN ILLINOIS

The 1924 winter-wheat crop in Illinois was the poorest in average yield per acre since 1916. Insect pests were almost negligible, so it is inferred that the low yield in many counties was due to weather conditions. The percentage, by counties, of the 1924 yield per acre to the 14-year average shows that in general the yield was good north and west of the Illinois River. Very little winter wheat is grown in the northern counties, where the percentages are high. On the other hand, the percentages are low in one of the most important producing areas, the Illinois counties in the vicinity of St. Louis.

There were no adverse weather conditions prior to January, and wheat continued in good condition as a rule. January was a cold month. On the 5th the minimum temperature ranged from -4° to -25° at the extreme ends of the State, with little or no protection in the center and south, where the tops were frozen back. The temperature was less severe in the south. On the 21st it ranged from -11° to -24° throughout the northern division and much of the central, but with a general snow cover. The late-sown wheat was damaged by freezing and thawing during the latter half of February. May was unusually cold and cloudy, retarding the advance of vegetation. The winter's damage was progressively worse from north to south, there being considerable abandonment, and at harvest time the crop varied in condition from mostly good in the north to largely poor in the south.—C. J. Root.

CALIFORNIA FIRE SEASON CLOSED BY TIMELY RAINS

The most disastrous fire season that has occurred in California in a decade was closed this month by timely fall rains. Two years of markedly deficient rainfall was the outstanding factor which brought about this critical condition. The 1924 fire record surpassed, in number of fires and total area burned, that of 1917, a record fire year, also one of the driest seasons ever experienced in the State.

During the period January 1 to October 20 there were 2,439 forest, brush, and grain fires in California, which burned over 827,000 acres—an area greater than the State of Rhode Island—and caused an estimated loss of over \$5,000,000 worth of natural resources and improved property. Thirty-two per cent of all fires were caused by lightning and 68 per cent were due to careless acts of man. Of the man-caused fires, 38 per cent were traced to smokers, largely users of "tailor-made" cigarettes, and campers were responsible for 13 per cent; incendiaries, 14 per cent; brush burners, 8 per cent; railroads, 6 per cent; lumbering operations, 4 per cent; and miscellaneous causes, 17 per cent.

Out of the total of 2,439 fires, 1,890 were within or adjacent to national forests and 549 were on State or

private lands. Government land burned over amounted to 365,332 acres, or less than 2 per cent of the national forest area of the State. Private and State lands burned totaled 461,668 acres. The United States Forest Service spent \$920,000 on fire suppression during the season.

Outstanding features of the 1924 fire season were: Four fire fighters killed on the fire line; the occurrence of over 100 large fires, ranging from 2,000 to more than 50,000 acres in area; the closure to public use of 10,000,000 acres of national forest land, and restrictions on camping and smoking placed on several million additional acres; the intensive state-wide educational campaign by the fire emergency organization sponsored by the Forest Service, State Board of Forestry, and the California Development Association, and the splendid backing given the fire-prevention movement by the press, organizations, and public-spirited citizens.—*United States Forest Service California District News Letter, October 31, 1924.*

THE EXTINGUISHING OF A FOREST FIRE BY SEA FOG

(Reprinted from Science Notes in Science, November 21, 1924)

A heavy dripping fog rolled in from the Pacific Ocean and put out effectively a fierce forest fire which had been burning for days in the Olympic peninsula southwest of Port Angeles, Wash. This is the only time recorded in northwest forestry of the occurrence of such a phenomenon. With no indication of rain and lacking water with which to fight the advance of the flaming menace, foresters watched the fire making progress toward the town of Quilcene, beyond which lay valuable tracts of big trees, when suddenly the wet fog descended. Like a huge gray cloud it settled down upon the forest, enshrouding everything. The fire fighters fled in terror lest they become bewildered and lost on the mountain sides. Soon the pungent smell of cedar and hemlock smoke disappeared and by mid afternoon, when the fog lifted, there remained but a few smoking dead logs, while all about the charred trunks of former merchantable trees dripped with water from the providential fire extinguisher.

WEATHER MAPS AT SEA

It may be interesting to recall the successive attempts that have led up to the preparation of daily synoptic weather maps on board ocean steamers.

As early as 1907 sporadic radio reports of meteorological observations made on ocean-going vessels were communicated to weather services on shore for use in weather forecasting, but the first organized effort to construct a daily synoptic weather chart at sea was the one conducted by Dr. P. Polis, director of the meteorological observatory of Aachen, Germany, on a voyage from Europe to the United States and return on the steamship *Kaiserin Auguste Victoria*, in August, 1908.¹

It was not until after the war that the matter was revived, at which time the National Meteorological Service of France, cooperating with the Compagnie Générale Transatlantique, developed a system of collecting meteorological reports and preparing therefrom twice-daily synoptic weather charts on the steamship *Jacques Cartier*, Captain Chabot. These charts were based on reports from continental and oceanic areas and were unusually complete in scope and detail. The most

¹ Polis, P. Wireless telegraphy in the service of modern meteorology, MO. WEATHER REV., 36: 407, and Chart IX, August, 1908.